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# SAVING THE FORESTS

And Related Wildlife  
Resources From Insects  
and Diseases

U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE PA-666





## Introduction

Americans are looking over the shoulders of pesticide users more

and more often. For example, the 1964 forest insect aerial spray projects were observed and monitored by more people than ever before in the history of forest pest control.

This growing interest has been welcome and beneficial to forest conservation. It has drawn public attention to the destructiveness of forest insects and diseases. It has helped in obtaining the highest standard of performance on chemical spraying projects. It has pinpointed the need for additional research.

The Secretary of Agriculture is authorized by law to take cooperative and independent action to protect the Nation's forests against destructive pests. It is the policy of the Department to practice and to encourage the use

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*Cover Photo: One ally in the never-ending effort to keep forest insect pests in check is this clerid beetle poised to eat a southern pine bark beetle burrowing his way out through the bark of a tree.*

of those means of effective pest control which present the least potential hazard to man and animals. When persistent pesticides must be used to control or eliminate pests, the Department urges that the smallest effective amounts be applied precisely to the infested area at the lowest effective frequency. Biological, ecological, or cultural methods or nonpersistent and low-toxicity pesticides will be used whenever they are feasible and will safely and effectively control the pests.

This booklet outlines how USDA's Forest Service, through delegation of authority from the Secretary, carries out this policy.

Let's briefly review the impact of the earth's most common living forms—Insects and diseases—on the forest resource. American foresters have a formidable array of forest pests to cope with, on vast forest areas. In the United States, commercial forest lands total 489 million acres. If we add the 175 million acres of noncommercial forest land, we have 664 million acres of forest lands which harbor a multitude of forest insects and diseases.

Protecting this woodland from forest pests is complicated by the fact that America's forests contain 152 species of commercial trees and 892 species of noncommercial trees—a total of 1,044 native or naturalized species. Every one of those tree species has its own brand of insect or disease enemies. Some of the less selective pests attack more than one species.

In a few months, bark beetles can kill a stand of pine, spruce, or fir trees that took 300 years to grow. If this were a row crop, it could be replaced in a year. To replace a tree takes generations. Insects and diseases attack trees in different ways and in all stages of growth. Many insects, for example, are specialists. Some work above the ground, some below. Each has its favorite part of the tree. Some feed on its leaves, others on its wood, its flowers, its seeds, its buds, the growing layer (the cambium), or the roots. No part of a tree is immune to insect attack. The same can be said about forest diseases. A forest pest threat, to some degree, lurks in the forests always.

## **How the Forest Service Does It**



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*Double-checking the details of a spray operation against a tussock moth outbreak: An entomologist, a forest ranger, and a pilot make double-sure that the job is done according to plan.*

**PLANNING A PROJECT.**—The Forest Service and its cooperators carefully study and evaluate the local forest pest situation. In so doing they determine the probable extent of damage to the forest and the best control method to use if expert opinion predicts a high loss of trees. Then they weigh the expected economic loss, if the epidemic is allowed to continue, against the cost of bringing it under control. Only after specialists have concluded that benefits will exceed the cost, that effective control can be attained, and that proper safeguards can be employed to protect other values, are action plans drawn up for a control project.

**PROPOSED ACTIONS ARE REVIEWED.**—Proposals are reviewed by local Federal and State forestry officials, Federal and State health agencies, wildlife biologists, and affected re-

gional groups. They are also reviewed by regional Forest Pest Action Councils—advisory bodies that are familiar with all aspects of the problem. After a project passes these local reviews it is submitted to the Forest Service headquarters in Washington for further evaluation by the Department of Agriculture. The final review following USDA evaluation is made by the Federal Committee on Pest Control, which recommends either approval or rejection of all pesticide projects involving Federal funds.

The Committee thoroughly studies each proposal from the standpoint of problems arising from pesticide use that pose hazards to human health, livestock, crops, fish, and wildlife and to the well-being of business, industry, agriculture, and the public.



**1 Prevention** The best forest is a healthy one. To keep it that way, protection and good management, including good silviculture, are required. To practice good forestry takes manpower, technical skill, and money. A forester knows that an ounce of prevention is worth a pound of cure. He therefore applies cultural practices of proven effectiveness to help pest-proof his forest.

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**2 Detection** Constant vigilance in detecting epidemics is the watchword. Foresters, woodsmen, towermen, and air observers keep a sharp lookout for danger signals. All other forest users—fishermen, hunters, etc.—can help too by reporting abnormalities promptly. Early detection makes it possible to diagnose and treat a pest problem before it becomes a major outbreak, thus saving time, money, and the forest.

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**3 Evaluation** Once an abnormal pest situation is reported, what's done about it? Plenty! One or more regional insect and disease survey crews swing into action. Scientists make an on-the-ground investigation. Then they perform laboratory and field tests to gage the seriousness of the outbreak. Foresters and other specialists then evaluate the threatened forest resources and together with the scientists recommend a course of action.

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**4 Suppression** Does that action necessarily mean "spray"? No! The decision may be to wait and see. Sometimes outbreaks subside without seriously damaging the forest. Where there is a market for the trees, prompt salvage logging may be the solution. If the timber can't be utilized, affected trees may be felled and burned. Chemicals are used only as a last resort.

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## We Need Forest Resources

About one-third of the Nation's land area is forested. For every acre of public forest land there are 3 acres of private woodland. From these forests comes the wood we use. They are also the setting for most of our outdoor recreation. As multiple-use forests they are the source of habitat for fish and wildlife; forage for big-game animals and livestock; water for agriculture, home, and industry; and a myriad of special products such as Christmas trees, turpentine, maple syrup, nuts, berries, medicines, chemicals, and organic mulches. Timber-based economic activities provide jobs for about 3.3 million people and add \$25 billion to our annual gross national product.

America's 4½ million small privately owned forests are the Nation's most important single source of forest products. These private woodlands furnish one-half of all the raw wood processed by the country's forest industries. When wisely protected and managed, our woodlands produce a never-ending stream of products and benefits. They can be an important source of added income for their owners.



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*The forests of America including this "sea of trees" provide abundantly for our needs in wood, forage, water, wildlife, and recreation. Their future depends on their protection and management today.*

## **Forests Need Protection**

Forest pests have wiped out the American chestnut, are on the way to doing the same with the American elm, and cloud the future of the true firs. Growing of white pine has been made difficult and more costly by the blister rust disease and white pine weevil.

In epidemic eruptions, insects and disease often leave vast areas of ghost forest—dead snags that create dangerous forest fire conditions and disfigure the landscape. They damage timber, wildlife habitat, and watershed values. The saw-timber lost annually to pests would build 1½ million homes for American families.

Foresters are working to reduce this waste. Their tools are varied and the best that scientists have developed. New improvements are making these more effective and safer for man and woodland creatures. When other control methods are lacking, the forester turns to pesticides. He recognizes the risks involved; he knows that the responsibility for their use can never be taken lightly. But neither can the responsibility for losing a forest by default. Our forests deserve the best protection we can afford.



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*Uncontrolled attacks by insects and disease leave acres of dead trees in their wake. These stark sentinels were once green and beautiful ponderosa pine trees.*

## ***The Protection Job***



COURTESY OF NORTH CAROLINA FORESTRY DEPARTMENT

*Scientists study the life history and behavior of caged insect predators. Knowledge gained will be applied in the defense of our forests.*

Forest pests respect no boundaries. The farmer's or rancher's 40-acre woodland is just as fair game for forest pests as is a National Forest, a State Forest, or an industrial forest. Accordingly, the Forest Pest Control Act of 1947 not only provides for protection of the National Forests and other Federal forest lands but provides for cooperation by the Forest Service with State and private landowners in protection of non-Federal lands.

Pest control scientists agree that time is of the essence in effectively controlling outbreaks. The first sign of forest pest activity should be reported to the nearest forester. Forest Service personnel have been trained to be constantly alert to detect any unusual activity by forest pests. State-employed and industrial foresters have been alerted also.

Foresters, however, need cooperation by the owners of the 4½ million small forests in detecting and reporting immediately any unusual insect or disease activity in their woods. This is particularly important to owners who are managing family forests for profit with multiple use. An unchecked insect attack, for example, can decimate the trees in a prime forest campground on which the family relies for added income.

In firefighting, foresters know that the cheapest fire is a small fire. If forest fires are to be kept small, they must be

*One pest control measure, shown here, is to spray chemicals on infested trees, killing the beetles beneath the bark before they can emerge to spread and reproduce their kind.*

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detected early and attacked promptly. The same is often true of insect and disease outbreaks. A team effort by foresters, landowners, forest users, and others can go a long way toward keeping outbreaks small.

**GROUND CONTROL OF FOREST INSECTS.**—A ground insect suppression project may range from a few trees or acres to many thousands. Typically, from 1 to 1½ million infested trees, stumps, and cull logs must be treated each year by ground control methods to reduce populations of bark beetles, weevils, and other twig and bark-infesting insects. There are three commonly used methods: (1) Commercial logging of affected or susceptible trees, (2) felling, piling, and burning the trees that must be eliminated and (3) application of insecticides.

Suppression of bark beetles, major tree killers in the West and South, requires the largest share of the national pest control effort. Bark beetles are the most destructive of all coniferous forest pests. They kill about 4½ billion board feet of timber annually. Whenever possible, infested trees are cut and removed from the forest while the insects are still in the larval stage: before the adult beetles emerge to infest additional trees. Because some areas are not accessible



*When measures such as aerial spraying of insecticides become necessary, precautions are taken to insure the utmost safety. This flight is the culmination of many man-months of preparation.*

enough for profitable logging or because there is no ready local market for logs, not all infested trees can be salvaged. Each year, about 300,000 trees are felled and burned to kill the insects in them.

Forest plantation insects such as weevils, scales, aphids, spittlebugs, and tip moths can cause great damage in the Eastern, Southern, and Lake States. They must be controlled to help protect public and private investments in reforestation.

**AERIAL SPRAYING.**—Aerial spraying is complex and hazardous. It requires painstaking preparation to insure safe, effective results. The preliminary phase of an aerial spray job may require months, the operational phase only a few

days. However, aerial spraying is sometimes necessary to control epidemics of defoliating insects. The most destructive leaf eaters in conifers are budworms, loopers, needle miners, tussock moths, and sawflies. Epidemics of these pests have killed hundreds of thousands of acres of coniferous trees. Many leaf-eating insects attack hardwood trees. Among the most damaging of these are the gypsy moth, webworms, and tent caterpillars.

Defoliating insects pose a continuing threat to forest resources. They are active over millions of acres each year, but normally their depredations are kept within tolerable limits by natural controls such as parasites, predators, and disease organisms. Occasionally they get out of hand. It is then

necessary to assist nature by spraying. In an average year this requires spraying about a million acres. Type of insecticide, dosages, methods, timing of application, and precautions taken are in accord with Department of Agriculture policies noted on page 2.

**DISEASE CONTROL OPERATIONS.**—Control of white pine blister rust disease is maintained on 15 million acres of white pine stands in 11 eastern States, three Lake States, and five western States. The rust cannot spread directly from pine to pine but must alternate between pines and "ribes" hosts (currants and gooseberries). Each year control is effected by removing "ribes" from 200,000 to 250,000 acres of Federal, State, and private land. Most of these plants are destroyed by spraying the individual bushes with herbicides. In certain locations, however, they are removed by hand pulling or grubbing.

Other disease control projects include Federal and Federal-State cooperative actions in the East and South to check the tree-killing oak wilt; a program to curb root diseases found in conifer plantations; fumigation of forest nursery soils to prevent damage to seedlings by nematodes and root pathogens; and a program through sales and timber stand improvement to reduce the damage done by the parasitic dwarf-mistletoe in western coniferous forests.



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*Forests of the future must be protected today. Improved methods and new weapons are needed in the fight to "save the forests."*

### ***What of the Future?***

USDA's scientists are continually searching for better and safer ways to check destructive pests. The Forest Service, for example, is doing insect and disease research at eight Forest Experiment Stations and a number of project centers. Much of this work seeks to find new and improved biological, silvicultural, and other nonchemical means of regulating forest pests. A Forest Service insecticide evaluation project has been established at Berkeley, Calif. Here scientists in cooperation with State and Federal health officials, universities, industry, and others are screening and testing

chemicals for their effects on insects, plants, animals, and humans. This complements the work of the Fish and Wildlife Service laboratories at Denver, Colo., and Patuxent, Md., which are chiefly concerned with the effects of pesticides on fish and wildlife.

The Forest Service, pressing its search for an effective substitute for DDT, carries out field trials of nonpersistent pesticides. Each year it schedules pilot tests in selected locations to evaluate the effectiveness of one or more promising non-persistent insecticides against one or more destructive insects. Other studies are designed to test specific formulations of other pesticidal chemicals, microbial agents, and virus organisms. In recent years, these tests and studies have resulted in less dependence on persistent pesticides such as DDT in pest control operations.

Nationally, the Forest Service cooperates closely with private landowners, States, and other Federal agencies in all control work. Internationally, Canada, Mexico, and the United States coordinate forest pest control efforts under the auspices of the North American Forestry Commission of the FAO, United Nations. Scientists of the three nations pool their knowledge for the benefit of all.

While the search for better ways to curb forest pests goes on, the forester must protect the forest with the tools he has today. The Secretary of Agriculture is authorized by law to take cooperative and independent action to protect the Nation's forests against destructive pests. The Forest Service,

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by delegation, works with public and private landowners to accomplish this difficult task. During the 17-year period 1950-67 under this program, about 34 million acres of public and private forest land have been successfully treated by biological, cultural, mechanical, or chemical methods or by a combination of methods. Many epidemics have been checked and kept from spreading. This has been done with minimal effect on other forms of life. Although the record is good, it will be improved as research and experience bring new advances in forest pest control.



U.S. DEPARTMENT OF AGRICULTURE



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